U.S. Control of Space: Essential to Our National Security

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Essential to Our National Security

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Chapter 1

Control of Space — An Overview

> ***"…In the long haul, our safety as a nation may depend upon our achieving "space superiority" …"***
>
> *General Bernard Schriever, USAF*
> *1957*

On October 4, 1957 the Soviet Union launched Sputnik I, the first man-made satellite into low earth orbit. Although harmless, Sputnik I 'beeped' continuously for over three weeks as it orbited the earth every 95 minutes and touched off a wave of anxiety in the United States (US).[1] The race for space was on and those who had spent time pondering the potential impact of space on our national security clearly understood what Sputnik meant. Perhaps Unites States Air Force General Bernard Schriever, the father of our national military space program, summed it up best in 1957 when he recognized that '... *in the long haul, our safety as a nation may depend upon our achieving space superiority. Several decades from now the important battles may not be sea battles or air battles but space battles...*'[2] General Sebriever's assessment reflects the minds of US strategists at the time and is now appreciated as a brilliant display of forward thinking about the importance of space to our national security.

Since the dawn of the space age and Sputnik forty-one years ago, space has played an increasing role in our national security and has had phenomenal effect on the development of our nation's science, technology and economy. Today, there are over 2,560 active satellites in orbit around the earth. In addition to satellites, there are 88 deep space probes and over 6,100 various pieces of debris totaling over 8,800 man made objects in space.[3] Like General Schriever, today's

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[1] Mark Carreau, *With Sputnik Launch 30 Years Ago Space Race In Orbit*, 4 October 1987.
[2] *Armed Forces, The Bird & the Watcher*, Time, 1 April 1957, 16.
[3] United States Space Command, Satellite Box Score, (WWW see bibliography).

strategists are again rediscovering that the ability to control space is essential to our national security.

The purpose of this paper is to provide an overview of space control, review the present-day importance of space systems to the United States, discuss the present threats to our space systems, address current issues regarding the control of space including a discussion on the emerging threat, and offer several recommendations regarding how the Unites States should proceed to further enhance our national security concerning space.

Today, the US vision for warfighting, Joint Vision 2010, is based on the ability to "gain dominant battlespace awareness", that is "an interactive picture which yield much more accurate assessments of friendly and enemy operations within the area of interest."[4] Military history is replete with examples to underscore the importance of timely and accurate information. But to fully appreciate why we place so much emphasis on information, we only have to look back to 1991 and the Persian Gulf War.

In the Persian Gulf War, during the initial pursuit of diplomacy to resolve the crisis with Iraq, US forces used a long six-month period of time to mass and organize coalition forces into a formidable fighting force. The use of armed military force against Iraq began on 16 January 1991 in the form of an air campaign. General Colin Powell, then Chairman of the Joint Chiefs of Staff, summarized the war plan best when he told the world in a 23 January Press Conference, *"Our strategy for dealing with this army is very simple. First we 're going to cut it off then we're going to kill it."*[5] After attaining air superiority, General Schwarkopf initiated a ground campaign designed to drive deep into Iraqi territory using a 'wide left sweep' (sometimes

[4] Joint Vision 2010 (Chairman of the Joint Chiefs of Staff, Washington D.C., 1997), 13.
[5] US News & World Report, *The Right Stuff* 4 February 1991, 26.

referred to as the Hail Mary Plan) to encircle and cut-off Iraq's forces in southern Iraq.[6] Prior to executing the ground campaign, however, US-led coalition forces took steps necessary to deny Iraq access to what was at that time a limited form of commercial space-based imagery from the French SPOT system.

Once air superiority was achieved by the air campaign, Iraq was essentially blinded and deafened and consequently never knew where US led coalition forces were or how they were maneuvering. Deprived of vital information and without adequate situation awareness, Iraq's forces were rapidly defeated deep within their own territory. There is no doubt that US space forces proved a key enabler in achieving victory in the Gulf War as the war with Iraq was the first conflict in history to make comprehensive use of space systems.[7] Military strategists understood well the vital role of space assets and their invaluable contribution to ensuring information dominance for US forces. In a March 1991 briefing to the National War College, Air Force Chief of Staff General Merrill A. McPeak, described the Gulf War the "first space war."[8] This statement was based on the realization that space assets clearly enabled commanders in the Gulf War to achieve information dominance and thereby control the timing and tempo of the war on allied terms.

The lesson and importance of attaining what we now call 'information superiority' and the use of space assets as demonstrated in the Gulf War is not lost on other nation's in the world. Today and in future conflicts, we must take active measures to ensure control of space if we are to attain space and information superiority and maintain our edge to observe, orient, decide and act—essentially to out think and out maneuver our adversary before he can take action. The ability to achieve information superiority is the basis of Joint Vision 2010's concept of

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[6] *Conduct Of The Persian Gulf War,* Final Report To Congress Pursuant to Title V, April 1992, 245.

[7] *Conduct Of The Persian Gulf War,* Final Report To Congress Pursuant to Title V, April 1992, 176.

"Full Spectrum Dominance" and is directly associated with space systems operating high over the terrestrial conflict. This is where the concept of space control comes into play as an essential element of our national security.

The United States Space Command (USSPACECOM) defines the control of space as "the ability to assure access to space, freedom of operations within the space medium, and an ability to deny others the use of space, if required."[9] USSPACECOM, the single focal point for military space for the United States, has carefully crafted a vision for space as well as a framework and a long range plan to focus the US national military strategy for space. The professional judgement and accompanying vision of USSPACECOM holds that achieving and maintaining control of space will influence the attainment of all future national and military objectives.

The national security of the United States is inextricably tied to the capabilities from space systems. All forms of national power—military, economic, political and informational—are increasingly dependent on the entire array of military, civil governmental and commercial space systems. Space systems have become extremely important to our nation and are vital in terms of exercising our national instruments of diplomatic, economic and military powers. The 1998 National Security Strategy clearly states a national policy to ". . .maintaining our leadership in space" and our ability to exercise control of space is essential."[10]

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[8] Richard H Schultz Jr. and Robert L Pfaltzgraff Jr., *The Future of Air Power in the Aftermath of the Gulf War,* 241.
[9] United States Space Command, *Long Range Plan,* 19.
[10] *National Security Strategy For A New Century*, The White House, October 1998, 25

Chapter 2

Present-day Importance of Space Systems to the US

Military Importance. For the US military, space has become an incredibly powerful force multiplier to our modern-day armed forces to the point where "assured space capabilities are critical to military operations."[11] When reviewing Operation Just Cause, the 1989 conflict in Panama, General Carl Steiner stated that *"space doesn't just help... I cannot go to war without space systems."*[12] The US military, now the smallest peacetime all-volunteer forces since before World War II, is increasingly reliant on information and capabilities from space systems. The Persian Gulf War confirmed our emerging reliance on space systems for warfighting success. A former commander of Army Space Command, Lieutenant General D. Lionetti stated that *"One has to look at Desert Storm to realize that the Army can never go to combat again without effective and adequate support from space systems."*[13] Today, US soldiers, sailors, airmen and marines maintain their ability to dominate the modern battle space through the use of timely and accurate information made possible by satellites for key communications, navigation, weather monitoring, surveillance and reconnaissance activities. Since Desert Storm, defense planners have "certified the irreplaceability of satellites…future warfare".[14]

Following the Gulf War, defense strategists have consistently documented the importance of space to our nation's security and have pursued policies to ensure space operations are integrated into routine defense capabilities. All major policy documents, including the US National Space Policy, National Security Strategy, National Military Strategy, The Air Force's visionary concept of Global Engagement, the National Defense Panel, and the US Space

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[11] Air Force Space Command, Command Overview Briefing, Spring 1998.
[12] Richard H Schultz Jr. and Robert L Pfaltzgraff Jr., *The Future of Air Power in the Aftermath of the Gulf War,* 241.
[13] Air Force Space Command, Command Overview Briefing, Spring 1998.
[14] Steven Lambakis, *National Space Policy,* Armed Forces Journal International, September 1998, 34.

Command's Vision and Long Range Plan--all pursue one universal theme: "Globally accessible space assets must be integrated into combat operations if the US armed forces are to maintain their core competencies and achieve national security objectives."[15]

There is a clear trend taking shape as "the focus of space warfighting has shifted from a strategic, Cold War orientation to a greater emphasis on the tactical exploitation of space and support to the warfighter in conventional operations."[16] Until recently, the DoD has primarily focused on the need to leverage and exploit the capabilities of space systems to meet our daily national security needs and when required, to use space systems to help fight and win our nation's wars. However, today's military leaders must take a broader view and move beyond thinking of space systems supporting military operations surrounding land, naval and air warfare, In today's military operations, and with concepts embodied in Joint Vision 2010, the success of our national political and economic interests have become increasingly tied to space systems.

The military no longer dominates the space arena and it is critical that military policymakers understand the economic and commercial trends as they relate to space forces. When pondering the national need for control of space, national security and military strategists need to take a holistic view of space systems and take into account the increasing value of these systems to our political and economic security interests.[17]

USSPACECOM envisions an emerging era where the United States and it allies will "share the high ground" with other "national military forces, paramilitary units, terrorists, and any other potential adversaries." The arena will be complex as "Traditional military, civil, and commercial capabilities in space are rapidly converging..." where "...adversaries may also share

[15] Steven Lambakis, *National Space Policy,* Armed Forces Journal International, September 1998, 34.
[16] Johnson, Dana, et al. Space: Emerging Options For National Power, 1998, xv.
[17] Johnson, Dana, et al, Space: Emerging Options For National Power, 1998, xii.

the same commercial satellite services for communications, imagery, and navigation."[18] In fact, this era has already begun.

Economic Importance. In terms of the economic value of space, where are we now? The phenomenon described above related to blurred military and civil space systems has already happened in the critical area of navigation and timing. The Global Positioning System (GPS), originally developed to support US military forces, is now essential to the US Department of Transportation's management of air, land, and maritime transportation.[19] GPS, however, is rapidly becoming the world standard for navigation and timing—moving at an increasing speed well beyond serving the military and the US Department of Transportation. Today, the US Air Force provides GPS signals worldwide with civil-grade accuracy (100 meters or less) to anyone who has purchased a commercial GPS receiver. Today, there are thousands of companies involved in GPS equipment alone. In a March 1997 lecture to Princeton University, Secretary of the Air Force Sheila Widnall described the economic value of GPS when she reported “Estimates are that added [GPS] usage will bring 20 billion dollars worth of industrial activity to North America."[20] On 28 March 1996, a Presidential Decision Directive (PDD) [NSTC-6] was signed that states the use of GPS accuracy degradation feature, called Selective Availability (SA), will be terminated by 2006 (if not sooner). Once "SA" is removed, GPS accuracy worldwide will increase substantially (better than 16 meters compared to the guaranteed civil accuracy of 100 meters provided today). When you consider the declining cost of GPS receiver equipment, the commercial exploitation of GPS is expected to mushroom. In her speech, Secretary Widnall went on to say, "In all, the GPS market in North America is projected to be 64 billion dollars

[18] United States Space Command, *Long Range Plan.*
[19] States Space Command, *Long Range Plan, 5.*
[20] Air Force Policy Letter Digest, *Integrating Air and Space,* May 1997.

once selective availability of signals is turned off. That's a tremendous economic boon to American businesses"[21]

USSPACECOM reports that we have entered a new era, an era where US economic reliance on space has surpassed the military's. 1996 was the first year commercial space revenues surpassed government space expenditures (53% commercial to 47% government).[22] This is historically significant since the forecast is for continued strong military dependence on space and for even greater growth in commercial reliance on space systems in an age where information and timeliness drives profits.

General Howell M. Estes III, when he served as Commander in Chief, USSPACECOM, described a useful analogy that just as oil proved to be the engine for the industrial age, we are moving rapidly into the information age. General Estes has long argued that *"what drives the engine of the information age is space... [and that] the real explosion that is getting ready to happen is in commercial space [activitiesj"*[23]

Today, Space Command officials estimate there are over 580 active commercial satellites on orbit (200 plus are United States satellites) reflecting an investment of over 100 billion dollars. In the last seven years alone, annual growth has been twenty percent. One particular segment of the commercial space industry, communications satellites, is about to explode in growth. In 1998, the Iridium Consortium, a commercial personal communications company, went operational with 66 satellites in what is now the largest single constellation of satellites in the world. That record will not stand long.

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[21] Air Force Policy Letter Digest, *Integrating Air and Space,* May 1997.
[22] Force Space Command, Command Overview Briefing, Spring 1998.
[23] General Howell M Estes III, USCINCSPACE Speech: *Space As An Area Of Vital National Interest,* 3 Nov 1997.

In the next ten years, companies and investors will build, launch and operate somewhere between 1500 and 1800 new satellites valued at over 500 billion dollars.[24] In one new venture alone, Teledesic, approximately 288 satellites will be placed into low earth orbit to provide next-generation global high-speed "Internet-in-the-Sky" communications.[25] The company that will build these satellites, Motorola, plans to build and deliver for launch up to four new Teledesic satellites every week.[26] As the cost of building satellites and launching them into space declines, and consumer demand for timely and accurate information increases, companies will venture into space to provide new services and gain profits for their shareholders. Overall, the estimated investment on commercial space ventures in the next several years is over a half a trillion dollars. Many believe these estimates are conservative; that commercial investment in space with potential huge profits, is like a space launch—going up very fast!

Political Importance. The role of space systems in the formulation and timely execution of US international diplomacy is also growing. As a nation and world superpower, we admittedly employ intelligence, surveillance and reconnaissance (ISR) capabilities to carry out our national security strategy.[27]

These ISR capabilities include "space-based and airborne collection of imagery and signals intelligence"[28] Use of space-based imaging and information processing through these ISR systems "provides the ability to monitor treaty compliance, military movements and the development, testing and deployment of weapons of mass destruction."[29] Space systems, and the timely array of information they provide our national decision-makers, allow the US to

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[24] States Space Command, *Long Range Plan,* 3.
[25] Teledesic Corporation, www site (see Bibliography).
[26] Bruce A. Smith, *Motorola Begins To Work On Teledesic Design Requirements,* Aviation Week & Space Technology, 1 June 1998, 25.
[27] *A National Security Strategy For A New Century,* The White House, October 1998, 24.
[28] *A National Security Strategy For A New Century,* The White House, October 1998, 25.
[29] *A National Security Strategy For A New Century,* The White House, October 1998, 25.

continue to be a central international leader in the today's complex world. Space based capabilities directly support diplomatic actions to provide "global security by demonstrating that the United States is an invaluable ally, or would be a formidable foe."[30]

We have established the value of space systems to our national security interests—there should be no doubt that space is vital to achieving our nation's military, economic and political objectives. Vital national interests are defined as "those of broad, overriding importance to the survival, safety, and vitality of our nation."[31] Given the indisputable evidence of military [national security] reliance on space, coupled with exploding economic and political reliance on space systems, we have arrived at a point in time whereby our total national reliance on space for success in all areas—military, political, economic and informational—is so great, that reasonable leaders should agree that our space systems are indeed "vital interests" to our nation.

Chapter 3

Present Threats

It would be difficult—almost inconceivable to those who have reflected on it--to envision life without the space systems with which we have become so dependent. We need to take a good look at how vulnerable our space systems are and in a macro-sense, how vulnerable our nation is if a large portion of space systems are disrupted. The environment of outer space offers a wide range of natural threats to our space systems such as the remote possibility of a meteorite particle strike, solar effects, adverse radiation, and so on. But, through exploration and scientific study of the space environment, we have gained sufficient information to design certain levels of protection into our space systems to mitigate adverse effects from natural threats.

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[30] *A National Security Strategy For A New Century,* The White House, October 1998, 25.
[31] *A National Security Strategy For A New Century,* The White House, October 1998, 5.

Today's concern centers on potential man-made threats. Should we be concerned with an attempt by any nation or group to disrupt or destroy our space systems? The short answer is — absolutely!

Man-made threats to space systems can basically be divided into two main categories. The **first threat** comes from the ability of an adversary to wage a counterspace effort to degrade US and allied space systems. The **second threat** to US national security stems from an adversary's use of space to enhance their own warfighting capabilities against US forces or national interests.[32] Let's explore these categories in more detail to appreciate the ramifications of each type of threat.

First Threat -- Counterspace. Due to their cost and complexity, space systems have historically been built and launched based on the latest available science and technology to achieve their objective mission (communications, remote sensing, etc.). While this is highly desirable, in most cases we have not invested the time, effort and expense to build extensive defensive capabilities into our space systems. The reason is primarily two-fold. First, the cost of getting to space remains high. Consequently, the emphasis has been on building and launching only the components absolutely essential to performing the satellites mission. The cost of getting to orbit will decrease dramatically with the development of next generation launch systems. Secondly, there has been a broad perception there was little to no threat. What we're discovering is that our space systems, which include both the satellite in space and the associated ground command and control facilities, are in fact "...potentially susceptible to a number of offensive counterspace operations."[33]

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[32] Steven Lambakis, *National Space Policy,* Armed Forces Journal International, September 1998, 34.
[33]National Air Intelligence Center, *Threats To US Military Access to Space,* Wright-Patterson AFB, OH, 1998, 1.

The term *counterspace* generally refers to the ability to use lethal or non-lethal means to deny, degrade, disrupt, destroy or achieve deception against a space system.[34] This range of activities can be applied against all parts of the space system: the satellite, ground command and control facilities, and the signals being passed to and from the satellite.[35]

There is an increasing concern with the rapid worldwide growth in counterspace threats to our space systems. The US Air Force National Air Intelligence Center (NAIC) documented potential threats to space systems and the impact of the known threats to US military space capabilities in an unclassified 1998 limited distribution report. The NAIC assessment summarized the threat this way: "Counterspace...can be accomplished today by a number of potential adversaries.. .In the future, more and more countries could posses the means of directly engaging US satellites."[36]

This growth in counterspace capabilities is fueled in part by the ability to apply advanced technology such as supercomputers to lash together a myriad of complex activities to track and target our space systems. If you know where and how a space system operates, then you can attack it through various methods. Today's space strategists are primarily concerned with the proliferation of technology enabling the relative ease and low cost to jam space signals, employ information operations, and other techniques such as physically destroying a key satellite command and control center on the ground. More complex counterspace techniques being developed by several nation's involve applying costly anti-satellite technology to attack the satellite itself with high power energy sources as it flies over an adversary's territory or to physically destroy the satellite through direct engagement on orbit.[37]

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[34]National Air Intelligence Center, *Threats To US Military Access to Space,* Wright-Patterson AFB, OH, 1998, 2.
[35] Steven Lambakis, *National Space Policy,* Armed Forces Journal International, September 1998, 34.
[36]National Air Intelligence Center, *Threats To US Military Access to Space,* Wright-Patterson AFB, OH, 1998, 17.
[37] United States Space Command, *Long Range Plan,* 3.

A well-orchestrated space campaign against US space systems could be devastating. Consider just a few examples of potential affect upon US forces: Offensive counterspace operations against US space reconnaissance systems would "reduce situational awareness and could lead to military surprise, underestimation of enemy strength and capabilities, less planning, and less accurate targeting and attack effectiveness assessments. Interference with missile launch detection systems may degrade the US ability to perform missile defense and increase the psychological impact of an adversary's ballistic missile capabilities. The loss of communications systems would lead to command and control problems at all levels."[38] The sum of this threat results in far more than the loss of vital space systems. Left unchecked, the threats to our space systems directly translates into future lost battles and ultimately to loss of life.

Consider for a moment the amount of time, energy and considerable expense the US has invested in space systems to enhance our national security. One estimate is about 150 billion dollars by the year 2000 and that figure doesn't even begin to account for the almost immeasurable value that space systems provide our national security as we conduct a broad range of activities, including diplomatic efforts, military operations, and activities directly related to our information based economy.[39] If you think that level of investment is sizeable, then reflect back on the previous discussed forecasts for future worldwide commercial investment in space— over one-half of a trillion dollars in the next several years. The NAIC report mentioned above explicitly states that "commercial satellite communications systems are... at particular risk."[40]

So, we are in fact faced with a serious and growing threat to our space systems. Concurrently, our national security may also be placed at risk if an adversary employs space systems against our forces.

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[38] National Air Intelligence Center, *Threats To US Military Access to Space,* Wright-Patterson AFB, OH, 1998, 4.
[39] Steven Lambakis, *National Space Policy,* Armed Forces Journal International, September 1998, 34.

Second Threat -- Space Employment By An Adversary. There are many indications that other nation's are leveraging space to enhance their own national interests. This is not a surprise. Based on our own success and experience, we know that "space-based systems and products will increase our enemies potency and level the military playing field."[41] Knowing the value, importance and positive impact space systems have in enhancing traditional military operations, we certainly can understand why another nation would want access to space capabilities. The problem for US forces becomes more serious though when an adversary uses space systems for hostile purposes against our forces.

Access to information derived from space assets is becoming increasingly available to anyone who wants it. Today, commercial off the shelf software allows anyone with a Pentium class computer to track satellites on orbit, including reconnaissance satellites in low earth orbit "permitting even amateurs to know when and where a satellite will passes overhead."[42] Anyone with access to the internet will have instantaneous access to information from space including imagery from several existing commercial imaging space systems like those available today from the *US LANDSAT* or *French SPOT* systems. Within a few years, anyone will be able to get high-grade, near real-time imagery with a resolution of one meter or less.[43] The emergence of this awesome form of space power, in the hands of a capable adversary, does not bode well for future deployed forces.

The challenge will only grow in size and magnitude. USSPACECOM forecasts that "In 2020, prior to hostilities or during peace operations, an adversary will have sophisticated regional situational awareness. Enemies may very well know, in near real time, the disposition

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[40] National Air Intelligence Center, *Threats To US Military Access to Space,* Wright-Patterson AFB, OH, 1998, i.
[41] United States Space Command, *Long Range Plan,* 3.
[42] Steven Lambakis, *National Space Policy,* Armed Forces Journal International, September 1998, 34.
[43] United States Space Command, *Long Range Plan,* 3.

of all US and allied forces. They will command and control their forces with real-time access to precise navigation (position and timing), sub-meter imagery, highly accurate weather data, timely missile warning, and robust communications."[44]

Barracks Attack. One can only imagine the consequences if an adversary's use of a space system against US forces goes unchecked. During the Persian Gulf War, Iraq fired Scud missiles into Kuwait, Saudi Arabia and Israel. At the time, these medium range missiles were not very accurate and therefore not very militarily significant. They were essentially a weapon of terror. However, "of all the Scuds fired by Iraq, only one proved fatal to US personnel."[45] When the Scud indiscriminately hit the barracks, this one attack resulted in the single largest loss of American life during the entire war, killing 28 Americans and injuring 99 others.[46] Now, step ahead in thinking about a future where an adversary could conceivably employ space systems to find a target and launch a Scud missile (potentially topped by a Weapon of Mass Destruction) in a well-coordinated attack against our forces or a civilian populace. The resulting loss of life would most likely be enormous and shocking to the American public.

Without question, the US public and our national leaders could not tolerate this type of situation. It is reasonable to assume that given the technical and military capacity, they would want the US military to employ all available means and take whatever action necessary in order to prevent an adversary's use of space systems against our forces or civilians. If we collectively agree that any post-incident investigation of such a "space-empowered" attack would conclude that such an incident should have been prevented with all due speed, then a new present-day imperative emerges. It becomes imperative that we take action now to focus our time, energy

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[44] United States Space Command, *Long Range Plan,* 1.
[45] *Conduct Of The Persian Gulf War,* Final Report To Congress Pursuant to Title V, April 1992, 167.
[46] Curt Weldon, Missile defense Imperative, Washington Times, 28 February 1999, B4.

and resources to prevent an adversary from employing space systems against our forces in the future.

A little too futuristic for some? Here are two real world events that made the news and affected consumers and companies.

Two Real World Examples. Given the increasing public and commercial reliance on space systems like GPS and commercial imaging satellites, a central question becomes: will US leadership and more importantly, the US public tolerate threats to US national security and their lifestyle? Could an information-driven public rally around a mantra calling upon their government to 'secure the heavens'? It is not unthinkable.

HBO. In 1986, an individual calling himself "Captain Midnight" overpowered HBO's satellite transmissions using commercially available satellite communications equipment. HBO viewers saw their screens filled with the following message: *"Good Evening HBO from Captain Midnight. $12.95 a month? No Way! (Showtime/The Movie Channel beware.).*"[47] This incident demonstrated the susceptibility of commercial satellite communications. Since that 1986 event, the number of consumers worldwide depending on satellites has increased significantly. While seemingly harmless to most of the public, Captain Midnight demonstrated a modern form of piracy by overtaking control and use of HBO's satellite channels. Imagine the effect on the public if a technologically capable adversary began pirating satellite transponders on a wide scale. Far fetched? Not really. Today, we're constantly bombarded by reports of Internet 'hackers.' The technology and knowledge to gain control of a satellite channel is proliferating and this commercial threat must be taken seriously. In lieu of targeting a single ground-based Internet computer-server, a sophisticated hacker may venture towards a space-based Internet hub on orbit. Fortunately, satellite manufacturers are aware of this potential threat and take

precautionary measures to prevent all but the most sophisticated form of 'space pirates' from impacting satellite communications. While it may be hard to imagine this form of overt threat to a commercial satellite, consider the impact on the general public whenever an "unexpected loss" of a satellite arises. It happened in May 1998.

Galaxy IV Satellite. In May 1998, a single commercial satellite operating at 22,500 nautical miles above Kansas suddenly stopped operating. Over 45 million consumers were affected providing the world with a peak into what any future disruptions in space systems might look like. The sudden loss of the Galaxy IV immediately caused the blackout of most of the nation's 45 million personal pagers and wiped out the communications used by thousands of retailers and news organizations.[48] The economic impact to businesses and consumers from the two-day outage is very difficult to ascertain. Major news reports at the time portrayed a major 'slow-down' across the nation as businesses and individuals experienced life without the use of pagers. The untold economic setback was not lost on the many companies that used Galaxy IV to support their businesses. One Dallas, Texas based company, PageMart Wireless, immediately sent out a personal letter from the Vice President of Customer Advocacy expressing "regret the disruption caused by this unprecedented satellite failure."[49] PageMart immediately credited each consumer account for two-days worth of airtime.

At the time, officials reported that "hostile action did not cause the problem."[50] However, with the passage of time and perhaps more analysis, USCINCSPACE General Richard Meyers told reporters in February 1999 that *"We've seen a Galaxy IV malfunction and we didn't know why."* General Meyers went on to say that *"We've seen people try to jam*

[47] National Air Intelligence Center, *Threats To US Military Access to Space*, Wright-Patterson AFB, OH, 1998, 11.
[48] Robert S. Dudney, *The New Space Plan*, Air Force Magazine, July 1998.
[49] Fran Hopkins, PageMart Wireless postal letter to all customers, May 1998.
[50] Robert S. Dudney, *The New Space Plan*, Air Force Magazine, July 1998.

satellites. We know that there are people out there that will attack us asymmetrically..."[51] In today's uncertain world, when it comes to emerging space threats, one thing is beginning to appear certain -- similar difficulties like the loss of Galaxy IV are inevitable.

The threat to our space systems is indeed real. More importantly, it appears to be growing. US Space Command warns: "Our nation's increasing dependence upon space capabilities ... produces a related vulnerability that will not go unnoticed by adversaries."[52] According to the National Air Intelligence Center (NAIC), the threat is "growing, both in terms of the number of potential threat countries and the sophistication... In the future, more and more countries could possess the means of directly engaging US satellites."[53]

Responding To The Threat. What have we done thus far to mitigate this emerging threat and what are we planning to do in the future? In terms of past efforts, the US has expended resources into research and development efforts to defend against counterspace threats. The bulk of this effort has been to build the world's best space surveillance system—one that keeps track of over 8,800 objects in orbit.[54] We have also invested heavily in hardening many of our dedicated military satellites "against electro-magnetic pulse (EMP) generated by nuclear explosions and in reducing vulnerabilities to jamming" space communications.[55] As we could afford to, we have also built a certain degree of autonomy into our space systems to increase survivability and resilience to disruption. We have not, however, been able to build in robust protective features into all of our satellites. Two key factors have emerged to exacerbate the problem: first, the increasing military reliance on every one of our satellites for national security missions and secondly, the explosion in growth in the commercial space systems which provide

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[51] David Atkinson, *Threat Not Understood Well Enough Says Meyers*, Defense Daily, 8 February 1999.
[52] Robert S. Dudney, *The New Space Plan*, Air Force Magazine, July 1998.
[53] National Air Intelligence Center, *Threats To US Military Access to Space*, Wright-Patterson AFB, OH, 1998,17.
[54] United States Space Command, Satellite Box Score, (www see bibliography).

service to millions of civil consumers as well as an increasing number of military users for important support activities. In short, the problem is getting harder, not easier.

While the United States currently operates the world's best system to survey space and keep track of space objects, if a satellite is 'attacked', we currently have no way to get the information required to make an accurate assessment of what happened. Through national law and international agreements, all commercial aircraft are required to carry flight data recorder (FDR) and cockpit voice recorder (CVR)—the so called 'black boxes' (actually colored bright orange for easy identification in the event of an accident). Unlike the airline business though, "no military or commercial spacecraft currently carry sensors that could alert military space officials of an attack by lasers, electromagnetic energy or an anti-satellite kinetic-kill device."[56] This may be one of the best ways for the United States to assert its leadership in space.

While passive defensive measures against space threats are important, at some point we will most likely exceed our national ability to employ diplomatic, legal or other peacetime measures to maintain control of space. At that time, we will need to exercise active measures against the threat to our space systems or armed forces. Dr Steven Lambakis, a senior defense policy analyst with the National Institute for Public Policy, has reviewed and written extensively about our current state of national space policy. He reports that "the US does have some... capability to deny the enemy some uses of space...but current countermeasures against adversarial space systems are lacking in any significant depth…"[57]

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[55] Steven Lambakis, *National Space Policy,* Armed Forces Journal International, September 1998, 36.
[56] William B. Scott, *CINCSPACE Wants Attack Detectors On Satellites,* Aviation Week and Space Technology, 10 August 1998, 224.
[57] Steven Lambakis, *National Space Policy,* Armed Forces Journal International, September 1998, 36.

In order to gain depth and prepare for future national defense with space activities involving the control of space, USCJNCSPACE has put us on the correct path to "commit enough planning and resources to protect and enhance our access to, and use of, space."[58]

Chapter 4

Current Issues Concerning the Control of Space

Recognizing the vital importance of achieving space and information superiority, US Space Command released (7 April 1998) a Long Range Plan (LRP) to implement a vision for space for the year 2020.

> The 2020 vision: *"US Space Command - -**dominating** the space dimensions of military operations to protect US interests and investment. **Integrating** Space Forces into warfighting capabilities across in full Spectrum of conflict."*[59]

The Plan. The LRP reads very well, is 'on target' and offers a much needed sense of where we are in the maturation of our space forces and more importantly, what we need to do in order to attain the vision and objectives for 2020. The LRP's value is in its design as a central guiding document which holds the promise to forge consensus across the diverse space community (civil, commercial, military and national) and is intended as a baseline to influence future budgeting, planning and programming efforts as well as drive technology investment efforts to meet operational needs. Furthermore, the LRP is designed to guide the evolution of organizational change of operating and controlling space systems and the changes required for attaining new national space policy.

[58] Robert S. Dudney, *The New Space Plan,* Air Force Magazine, July 1998.
[59] United States Space Command, *Long Range Plan,* 10.

General Howell M. Estes III, USCINCSPACE at the time the LRP was developed and published, recognized the importance to discuss a range of topics central to developing US space power. He noted that *"trying to define a path from here to there requires the identification of all elements, whether you control them or not."* The LRP, therefore ends with an illuminating section entitled "Out Of Our Lane" with a focus on issues surrounding needed reform in existing policies, treaties and agreements. Nineteen specific topics merit top level national attention are identified for policy review (either alter or eliminate). The list is impressive and represents both a marked challenge as well as an incredible opportunity for the US to maintain world leadership in space.[60]

Space Law — Not A Show Stopper. Since the launch of Sputnik in 1957, a significant amount of space law has been developed governing space activities. Interestingly though, "only a few activities in space are legally restricted. Even certain weapons-related activities in space are permitted under the current legal regime."[61] Specific items, like Weapons of Mass Destruction (WMD) are banned under the Limited Test Ban Treaty and the Outer Space Treaty. One contentious treaty—the 1972 Anti-Ballistic Missile (ABM) Treaty--is currently receiving considerable debate as it relates to the National Missile Defense (NMD) program. However, this treaty does not explicitly limit deploying a wide range of capabilities involving the application of force from space. The point here with respect to the control of space, is that even though we have collected 40 plus years of space law, there appears to be considerable leeway to exercising legitimate national security activities required for the control of space.

Space Policy. We have arrived at a point in time where a very real emerging threat is forcing a spirited debate over space policy matters. This is especially true since both military

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[60]United States Space Command, *Long Range Plan*, 137.

[61] Steven Lambakis, *National Space Policy*, Armed Forces Journal International, September 1998, 36.

and civil dependency on space systems is increasing at a rapid pace. All parties should be able to fundamentally agree that space systems are so vital to our national security, that without them, we can not pursue nor achieve our national diplomatic, economic or military objectives. National opinion, both public and official, represents a much different challenge that is in many ways much more restrictive than current space law. Political issues surrounding military space activities—especially anything that resembles the so-called weaponization of space—are deemed both "contentious and polarizing."[62]

In the past several decades of developing our nation's space capabilities, domestic debate has traditionally defaulted to the issue of "purity" of the space environment. In fact, much of our early space policy was tethered to the notion that space should offer a sanctuary (of peaceful use) for any nation that could access and operate in space. That approach appeared to serve us well, especially in the Cold War era of covert space reconnaissance activities over denied territory. The sanctuary approach allowed us to put the bulk of our efforts toward development of spacecraft and sensor technology instead of space weaponry. Most likely we'll soon discover that much like the early days using balloons and airplanes for unmanned reconnaissance, the sanctuary of space will not hold for space reconnaissance. Those that espouse the 'purity' of space maintain that "dangerous instabilities may arise with the introduction of weapons" into space. This perspective plays well to the media sensationalism—after all, what threat? Today, however, we need to fundamentally "educate an otherwise misinformed public about the relevance of space" as it pertains to their livelihood and national security.[63]

However fortunate to date, the simple fact is that our nation and the US public in general has yet to be confronted with a space 'Pearl Harbor' nation-rattling event involving space.

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[62] Steven Lambakis, *National Space Policy,* Armed Forces Journal International, September 1998, 36.
[63] Steven Lambakis, *National Space Policy,* Armed Forces Journal International, September 1998, 38.

Despite the emergence of stronger language in recent policy documents, our present space policy is seemingly 'hollow'. It reads well, but like past policies continues to portray a sense that our nation's leaders are energized to bring to bear the power and resources of our nation to develop US space power and provide for the control of space in support of our national security. One can only hope that during this period of peace following the Cold War and Gulf War, that the United States can leverage these years of 'strategic pause' to actively take measures to develop robust space policies to ensure the development of US space power before a 'Pearl Harbor' event presents itself.

Emerging Debate. We have arrived at a point in time where we must conduct serious, public and professional debate on the challenges facing us in space to embolden our government leaders to make the hard decisions. The result should be a new national space policy. General Estes led the way and spurred the debate in speeches designed to raise the public awareness and call for action:

> *"We had better pay attention to it. We had better understand it, We had better be sure at least in the United States and our allies for that matter, that we have thought it through, and that we have policies established. We as a country, the United States in particular, the corporate world, the major powers in the world ... we have got to get our act together in terms of what space means to us and in the direction to head."*[64]

Similar thoughtful messages from other informed leaders appear to be taking hold in raising the public consciousness on space. The debate may have begun.

Colonel Frank Klotz, in a brilliant monograph on space, commerce and national security explains "current administration policy emphasizes the need to develop capabilities to protect American space systems and to deny the hostile use of space by adversaries. There is, however, no agreement over how best to achieve these objectives."[65] It appears the emerging debate is

[64] General Howell M Estes III, USCINCSPACE Speech: *Space As An Area Of Vital National Interest,* 3 Nov 1997.
[65] Frank G. Klotz, *Space, Commerce and National Security*, Council On Foreign Relations, January 1999.

formed between two central views on how best to secure our national security interests in space. There are those that contend we should maintain the sanctuary of space and pursue a course vested in arms control and other cooperative measures and avoid further militarization of space. Then, much like this paper attempts to relate, there is a perspective that holds that our nation's security is best protected from a position of military strength--that, in essence it is too late as there is too much already at risk.

On January 15, 1998, over a hundred respected national leaders openly discussed the importance of military space systems to our nation's security at a high-level roundtable discussion in Washington D.C.. The Honorable James Schlesinger, former Secretary of the Departments of Defense and Energy and Director of the CIA, along with two other former Secretaries of Defense, four former four-star flag officers and others stated an "overwhelming consensus of these officers and, indeed, of the conference as a whole, is that the United States military--particularly the down-sized military of today and that in prospect for tomorrow -- simply cannot perform its assigned functions without the assured ability to control space."[66] The distinguished leaders focused the issue for the public: "The point was made repeatedly that U.S. reliance on space was so great as to create a potentially devastating vulnerability if adversaries could deny us the use of that theater, to say nothing of being able to use it against us."[67]

These points were forcefully underscored by an Open Letter to the President publicly released for the first time in the course of the Roundtable. This letter, signed by 43 of the country's most eminent military leaders--including former members of the Joint Chiefs of Staff, Commanders-in-Chief (CINCs) and many other distinguished career officers: "We can think of

[66] Center For Security Policy, Press Release: Top Defense Practitioners Establish That President, Pentagon Must Ensure That US can Exercise Space Dominance, Washington D.C., 16 January 1998.
[67] Center For Security Policy, Press Release: Top Defense Practitioners Establish That President, Pentagon Must Ensure That US can Exercise Space Dominance, Washington D.C., 16 January 1998.

few challenges likely to pose a greater danger to our future security posture than that of adversaries seeking to make hostile use of space—or to deny us the ability to dominate that theater of operations."[68]

While the debate may be on, it will clearly take years of dedicated, professional and thoughtful effort to resolve the myriad of issues related to our national security space such as the nineteen topics identified in the US Space Command plan. Regardless of the course influenced by the outcome of the debate, there are several near-term actions that should be pursued.

Chapter 5

Recommendations

First, as a nation, we must get better organized to improve our opportunity to achieve future success. Currently, there are over 20 different government agencies that participate as stakeholders in our national space policy [see figure 1]. The White House is currently responsible for managing and coordinating space policy throughout the interagency process. The problem is that depending on the particular space issue, "policy falls not to one but two White House groups: the National Security Council and the National Science and Technology Council."[69] The National Science and Technology Council was created by executive order in November 1993 to coordinate policy in science, space, and technology.[70]

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[68] Center For Security Policy, Press Release: *Top Defense Practitioners Establish That President, Pentagon Must Ensure That US can Exercise Space Dominance*, Washington D.C., 16 January 1998.

[69] Frank G. Klotz, *Space, Commerce and National Security*, Council On Foreign Relations, January 1999.

Executive Office of the President

- Office of the Vice President
- Office of Science and Technology Policy
- Office of Management and Budget (OMB)
- Office of the U.S. Trade Representative
- National Science and Technology Council (NSTC)
- National Security Council (NSC)

National Aeronautics and Space Administration (NASA)

Department of Commerce

- National Oceanic and Atmospheric Administration (NOAA)

Department of Defense

- U. S. Space Command (USSPACECOM)
- Department of the Air Force
- Department of the Army
- Department of the Navy (includes the US Marine Corps)
- National Reconnaissance Office (NRO)
- National Security Agency (NSA)
- National Imagery and Mapping Agency (NIMA)
- Defense Advanced Research Projects Office (DARPA)
- Defense Information systems Agency (DISA)
- Ballistic Missile Defense Office (BMDO)

Department of Transportation

- Office of commercial Space Transportation, Federal Aviation Administration

Department of State

- Office of Defense Trade Controls

Central Intelligence Agency

Federal Communications Commission (FCC)

Figure 1. **Major U.S. Agencies Involved in space Policy (1999)**[71]

Congress has also demonstrated renewed interest in the national importance of the high ground of space and is becoming an active participant in the emerging debate. Senator Bob Smith(R-NH), is convinced our present organizational and funding methods are "short-changing space" and he firmly believes we should "embrace space power." In a November 18, 1998 keynote address before the annual joint conference of the Fletcher School of Government and the Institute for Foreign Policy Analysis, Senator Smith asserted that in order *"to achieve true dominance we must combine expansive thinking with a sustained and substantial commitment of*

[70] *Annual Report of the National Science and Technology Council*, White House April 1997. Available on: www.whitehouse.gov)

[71] Frank G. Klotz, *Space, Commerce and National Security*, Council On Foreign Relations, January 1999.

resources, and vest them in a dedicated, politically powerful, independent advocate for space power."[72] The speech was a significant marker of national interest and a reflection of strong sentiment we can expect to hear in the emerging debate on space power and the control of space.

It hasn't always appeared so confusing. In past administrations, a National Space Council, chaired by the Vice President, led the development and implementation of our national space policy. It is probably in our best interest to return to this structure. In the spirit of streamlining and reinventing government, it is reasonable to conclude that our national interests would be served best if we reestablished the National Space Council to enable the development and implementation of space policy. The world's only superpower, with by far the world's largest economy, should get organized to allow our nation to lead the world debate on matters involving space. We should establish and explain to the American public a coherent, straightforward plan for our nation's space program. This plan should leverage American ingenuity, pioneering spirit and allow the United States to showcase our technology. Taxpayers, commercial businesses, our nation's defense institutions—in fact, anyone who directly or indirectly benefits from space systems would be well served by this form of good government.

As the world's leading superpower, we should muster our resources to lead the world in dominating affordable and routine access to space. Under an effort officially called the Evolved Expendable Launch Vehicle (EELV) program, the US Air Force is currently working closely with industry to field a next-generation family of launch vehicles to substantially lower the cost of putting objects into orbit. While this is a major step in the right direction, it is not big enough or bold enough and it will not produce magnitude—order reductions in the cost of accessing space. We need to embark on a (President Kennedy style mandate) project not unlike "from earth to the moon in less than a decade" to challenge our science and technology to produce

[72] Senator Bob Smith, Speech: *The Challenge of Spacepower,* Cambridge, MA, 18 November 1998

revolutionary means of accessing space. Some effort to pursue this very, albeit risk-filled concept is currently underway, but it is hindered by a lack of governmental vision and sponsorship. It is widely recognized that every dollar we can save on the launch can be invested in actual on-orbit capability. The US government should provide the necessary investment capital to develop requisite revolutionary means to access space. Such a venture would ensure our continued world leadership in space as the economic benefit from this endeavor, not to mention the technical spin-offs along the way that would bolster our education base, propel our economy, and secure our national security for the better part of the next millenium.

When it comes to operating satellites and living in space aboard the International Space Station, we must be able to characterize all events surrounding an untold accident, or worse, an attack. In August 1998, USCINCSPACE, General Estes said, *"If there's one place I'd [spend] money, it would be putting sensors on important space-based systems we launch in the future, so we could tell when they come under attack."*[73] Beyond the obvious military significance, this makes only natural sense, especially in light of reduced launch costs and the increasing importance of both commercial as well as military satellites to our national security: Space experts acknowledge that any 'space black box' will consume precious weight, volume and electrical power aboard the host space system. The US government should provide significant incentives for space systems to carry licensed official "space-black-boxes" aboard their spacecraft. Perhaps the best way to assist this process is through both federal laws and regulations, but also through negotiated reductions in insurance costs for space systems. The ability to properly investigate and subsequently characterize the loss of a space system should be appealing to the space insurance industry, especially if backed by the full faith and credit of the

[7373] William B. Scott, *CINCSPACE Wants Attack Detectors On Satellites,* Aviation Week and Space Technology, 10 August 1998, 224.

US government. This type of endeavor would represent another clear sign of US leadership in world space matters. It should become "the law" and should be formally incentivized for maximum earliest benefit to all parties.

Finally, as has been discussed throughout this paper, when deterrence fails and we must take appropriate military measures in support of our national security, the United States Space Command will need a broad array of military capabilities to exercise the control of space. Therefore, the Defense Department should redouble present efforts as a national priority to research, develop and deploy military space capabilities for employment by USCINCSPACE. In 1957, General Schriever called for "spending a certain fraction of our national resources to ensure that we do not lag in obtaining space supremacy."[74] This is not new thinking, but the time may have come for us to finally get serious and place greater emphasis on capabilities involving the control of space in our annual defense budget. In addition to setting fiscal priorities, we should take action to organize for improved success.

The Secretary of Defense should reorganize national security space forces and enlarge current responsibilities of USCINCSPACE over all US government national security space systems as related to the development of space control capabilities and the coupling of coherent national space policy. If and when the day arrives that US space systems are attacked -- most likely without warning — that will not be the time to call a committee meeting of disparate stakeholders. As General Bernard Schriever so eloquently stated back in 1957, *"...the important battles may not be sea battles or air battles, but space battles..."*[75] Now is the time to get organized and better prepare ourselves to provide our National Command Authorities with timely and accurate assessment of what is happening in space. In concert with today's doctrine

[74] *Armed Forces, The Bird & the Watcher,* Time, 1 April 1957. 16.
[75] *Armed Forces, The Bird & the Watcher,* Time, 1 April *1957,* 16.

and strategy, we should move swiftly to assign USCINCSPACE with authority for Combatant Command and Operational Control over *all US national security space systems.* This authority is not a quibble over routine (local agency) tasking authority of space systems to carry out their routine missions, but an essential element of our nation's ability to execute timely and absolute command response during any period of conflict.

Conclusion

The control of space is essential to our national security. Space control also carries serious implications for war planners at the national or theater levels and should be considered as a major factor by Joint Force Commanders during planned or actual employment of U.S. joint and allied forces anywhere in the world. The emerging debate between the pursuit of arms control or increased military strength is healthy and should be pursued with rigor. It is quite likely that in the spirit and tradition of our great democracy, we will ultimately pursue both courses. This will occur because of certain undeniable truths: space control directly relates to our current and future National Security Strategy and National Military Strategy. And much like our ability to maintain freedom of navigation on the high seas and attain air superiority when required, the United States will require a demonstrated and robust capability to control space in order to preserve the peace and if required, gain space superiority in any future conflict.

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